

Recovery Plan Action Status

Plan Name: Recovery Plan for the Mauna Kea Silversword (*Argyroxiphium sandwicense* ssp. *sandwicense*)

Plan Status: Final

Plan Date: 30-Sep-93

Lead Agency: USFWS

Lead Office: Pacific Islands Fish And Wildlife Office

(808)

792-9400)

Species	Action Priority #	Action #	Action Description	Action Status	Est. Initiation Date	Est. Completion Date	Responsible Parties	Work Type	Labor Type	Action Comments
`Ahinahina (<i>Argyroxiphium sandwicense</i> ssp. <i>sandwicense</i>)	1	11	Search for unknown populations on Mauna Kea	Complete	Prior to FY 1995	FY 2000 - FY 2004	U.S. Fish and Wildlife Service, Ecological Services Division, University of Hawaii, Hawaii Department of Land and Natural Resources	Research: Population Surveys	Species Expert	The Hawaiian Silversword Foundation and other partners in the informal silversword working group have completed many hours of surveys for additional populations in the late 1990s, and found a few new plants in Waipahoehoe and Wailuku drainages. ES was not the lead for this task, even though it was originally designated so.
`Ahinahina (<i>Argyroxiphium sandwicense</i> ssp. <i>sandwicense</i>)	1	121	Remove feral ungulates from Mauna Kea Forest Reserve	Ongoing Not Current	Prior to FY 1995		U.S. Fish and Wildlife Service, Ecological Services Division, Hawaii Department of Land and Natural Resources	Management: Predator and Competitor Control	Internal Technical Assistance	The task is not completed, even though the State is under a court order to remove all feral sheep from Mauna Kea Forest Reserve since the 1970s for palila CH, which overlaps with some of the Mauna Kea silversword habitat. Currently, DNLR conducts periodic aerial hunts which keep the numbers low, but do not entirely eliminate the sheep.

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`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	1	122	Fence newly discovered individuals or populations	Ongoing Not Current	FY 2008		U.S. Fish and Wildlife Service, Ecological Services Division, Hawaii Department of Land and Natural Resources	Management: Habitat Maintenance and Manipulation, Management: Predator and Competitor Control	Contract, Internal Field Assistance, Volunteer	None of the additional individuals found in Waipahoehoe or Wailuku have been fenced, and probably will not be, as they occur in areas that are exceedingly steep and difficult to fence. A new population found in 2008 in Pohakuloa Gulch is in the process of being fenced.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	1	1231	Waipahoehoe Gulch: Enhance fencing of exclosure site	Ongoing Not Current	FY 2008		U.S. Fish and Wildlife Service, Ecological Services Division, Hawaii Department of Land and Natural Resources	Management: Habitat Maintenance and Manipulation	Contract	DLNR plans to replace the existing fence with FY 2008 funding.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	1	1232	Waipahoehoe Gulch: Extend fence to protect naturally occurring population	Not Started			U.S. Fish and Wildlife Service, Ecological Services Division, Hawaii Department of Land and Natural Resources	Management: Habitat Maintenance and Manipulation, Management: Predator and Competitor Control	Contract, Internal Field Assistance, Volunteer	As far as we know, there are no plans to include the remaining wild individuals in fenced exclosures. Many, but not all, of the wild individuals outside the existing Waipahoehoe fence are in areas inaccessible to goats and sheep and all are in areas exceedingly difficult to fence.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	1	1233	Waipahoehoe Gulch: Maintain fence lines	Ongoing Not Current	Prior to FY 1995		Hawaii Department of Land and Natural Resources	Management: Habitat Maintenance and Manipulation, Management: Predator and Competitor Control	Contract, Internal Field Assistance, Volunteer	This is an ongoing task as long as sheep and pigs still occur on Mauna Kea.

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`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	1	1234	Waipahoehoe Gulch: Remove ungulates that gain entry	Ongoing Current	Prior to FY 1995		Hawaii Department of Land and Natural Resources	Management: Habitat Maintenance and Manipulation	Contract	This is an ongoing task as long as sheep and pigs still occur on Mauna Kea. DLNR addresses this issue as it arises. The replacement of the existing fence in FY 2006 should reduce ungulate ingress for a few years.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	1	1241	Pu'u Nanaha: Enhance fencing of exclosure site	Obsolete	Prior to FY 1995		U.S. Fish and Wildlife Service, Ecological Services Division, Hawaii Department of Land and Natural Resources	Management: Habitat Maintenance and Manipulation	Contract	This task is no longer considered necessary, as the west side of the island appears too dry for long-term survival of plants during extreme drought episodes, based on the lack of success with past outplantings.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	1	1242	Pu'u Nanaha: Maintain fence lines	Obsolete	Prior to FY 1995		Hawaii Department of Land and Natural Resources	Management: Habitat Maintenance and Manipulation, Management: Predator and Competitor Control	Contract, Internal Field Assistance, Volunteer	This task is no longer considered necessary, as the west side of the island appears too dry for long-term survival of plants during extreme drought episodes, based on the lack of success with past outplantings.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	1	1243	Pu'u Nanaha: Remove ungulates that gain entry	Obsolete	Prior to FY 1995		Hawaii Department of Land and Natural Resources	Management: Habitat Maintenance and Manipulation	Contract	This task is no longer considered necessary, as the west side of the island appears too dry for long-term survival of plants during extreme drought episodes, based on the lack of success with past outplantings.

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`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	1	1251	Skyline: Enhance fencing of exclosure site	Obsolete	Prior to FY 1995		U.S. Fish and Wildlife Service, Ecological Services Division, Hawaii Department of Land and Natural Resources	Management: Habitat Maintenance and Manipulation	Contract	This task is no longer considered necessary, as the west side of the island appears too dry for long-term survival of plants during extreme drought episodes, based on the lack of success with past outplantings.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	1	1252	Skyline: Maintain fence lines	Obsolete	Prior to FY 1995		Hawaii Department of Land and Natural Resources	Management: Habitat Maintenance and Manipulation	Contract	This task is no longer considered necessary, as the west side of the island appears too dry for long-term survival of plants during extreme drought episodes, based on the lack of success with past outplantings.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	1	1253	Skyline: Remove ungulates that gain entry	Obsolete	Prior to FY 1995		Hawaii Department of Land and Natural Resources	Management: Habitat Maintenance and Manipulation	Contract	This task is no longer considered necessary, as the west side of the island appears too dry for long-term survival of plants during extreme drought episodes, based on the lack of success with past outplantings.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	1	1261	Halepohaku: Enhance fencing of exclosure site	Ongoing Current	Prior to FY 1995		U.S. Fish and Wildlife Service, Ecological Services Division, Hawaii Department of Land and Natural Resources	Management: Habitat Maintenance and Manipulation	Contract	This site is being maintained for education purposes, as it is immediately adjacent to the Onizuka visitors' center.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	1	1262	Halepohaku: Maintain fence lines	Ongoing Current	Prior to FY 1995		Hawaii Department of Land and Natural Resources	Management: Habitat Maintenance and Manipulation	Contract	This site is being maintained for education purposes, as it is immediately adjacent to the Onizuka visitors' center.

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`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	1	1263	Halepohaku: Remove ungulates that gain entry	Ongoing Current	Prior to FY 1995		Hawaii Department of Land and Natural Resources	Management: Habitat Maintenance and Manipulation	Contract	This site is being maintained for education purposes, as it is immediately adjacent to the Onizuka visitors' center.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	2	131	Inform persons using Mauna Kea Forest Reserve of regulations and penalties	Ongoing Current	Prior to FY 1995		Hawaii Department of Land and Natural Resources	Other: Law Enforcement	Internal Administrative	This task is ongoing.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	2	132	Restrict unnecessary entry into exclosure sites	Ongoing Current	Prior to FY 1995		Hawaii Department of Land and Natural Resources	Other: Law Enforcement	Internal Administrative	This task is ongoing.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	2	133	Include information on distribution of MKSS in existing federal and state fire management plans for Mauna Kea	Complete	Prior to FY 1995	FY 1995 - FY 1999	U.S. Fish and Wildlife Service, Ecological Services Division, Hawaii Department of Land and Natural Resources	Management: Planning	Internal Administrative, Internal Field Assistance	This task has been completed.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	2	21	Monitor existing population	Ongoing Current	Prior to FY 1995		U.S. Fish and Wildlife Service, Ecological Services Division, University of Hawaii, Hawaii Department of Land and Natural Resources	Research: Population Surveys	Graduate Student	The Hawaiian Silversword Foundation monitors the wild population annually for survival and flowering. The Hawaiian Silversword Foundation and DLNR monitor a portion of the outplanted individuals annually for survivorship, covering the entire population approximately every five years.

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'Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	2	221	Determine causes of premature mortality in established individuals	Partially Complete	Prior to FY 1995		University of Hawaii, Hawaii Department of Land and Natural Resources, U.S. Geological Survey, Biological Resources Division	Research: Habitat Requirements	Contract	Hawaii Volcanoes National Park and BRD will soon do some research on seed broadcasting for Argyroxiphium kauense, the results of which can potentially be applied to this subspecies. A graduate student at University of Arizona and staff at Haleakala National Park and BRD have conducted research on A.s. ssp. macrocephalum which has been applied to this subspecies.
'Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	2	2221	Determine physical & biological factors which limit growth, germination & seedling establishment	Partially Complete	Prior to FY 1995		University of Hawaii, Hawaii Department of Land and Natural Resources, U.S. Geological Survey, Biological Resources Division	Research: Habitat Requirements	Contract	University of Hawaii conducted research that was published in Biological Conservation (89:61-70) on seed establishment. Hawaii Volcanoes National Park and BRD will soon do some research on seed broadcasting for Argyroxiphium kauense, the results of which can potentially be applied to this subspecies. A graduate student at University of Arizona and staff at Haleakala National Park and BRD have conducted research on A.s. ssp. macrocephalum which has been applied to this subspecies.

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`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	2	2222	Determine and assess environmental and genetic factors limiting seed set.	Complete	FY 1995 - FY 1999	FY 1995 - FY 1999	University of Hawaii, Hawaii Department of Land and Natural Resources, U.S. Geological Survey, Biological Resources Division	Research: Habitat Requirements	Contract	The Hawaiian Silversword Foundation, from years of visits to the sites to monitor and hand pollinate plants, have determined that the species of the native solitary Hylaeus bee genus are the pollinators of this subspecies. Nonnative honey bees (Apis mellifera) visit the flowers but appear to steal pollen rather than move it between plants. Microsatellite genetic studies have been done (Conservation Biology 11: 1190-1146) showing that the population outplanted in the 1970s from two individuals, now totaling over 800 individuals, has only 25% of the genetic diversity of the ca 50 wild individuals alive at the time of the study.

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'Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	2	31	Design program to enhance regeneration within existing populations	Complete	FY 1995 - FY 1999	FY 1995 - FY 1999	U.S. Fish and Wildlife Service, Ecological Services Division, University of Hawaii, Hawaii Department of Land and Natural Resources	Management: Planning	Internal Administrative	Using the information from the genetic studies and monitoring, the Hawaiian Silversword Foundation, working with DLNR and ES, has developed a management plan which includes controlled breeding between the remaining wild individuals and between wild and originally outplanted individuals to increase the number of founders and equalize the number of individuals from each founder as much as possible in the reintroduced populations. No seed is left in the wild at this time, as the wild population is declining rapidly (approximately two individuals are lost every year prior to reproducing) and the seed is too valuable to leave to chance germination and establishment in the field. Controlled propagation is used to reintroduce seedlings, since previous outplantings have an 80+% survivorship.

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'Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	2	32	Implement regeneration program, as necessary and reduce causes of premature mortality	Ongoing Current	FY 1995 - FY 1999		U.S. Fish and Wildlife Service, Ecological Services Division, Hawaii Department of Land and Natural Resources	Management: Propagation	Graduate Student	Additional plants are added to the population whenever wild individuals flower and are cross pollinated to provide higher seed set. In 1996, two wild individuals flowered and over 3,000 individuals have been reintroduced with 80+% survivorship. No additional flowering occurred until 2005, and in September 2005 100,000 seeds were collected from hand pollinated crosses of the wild individual with several outplanted individuals. These seeds will be propagated at Volcano Rare Plant Facility and outplanted in the fall of 2006. No more individuals can then be added to the reintroduced populations until more wild individuals flower. The goal is to increase the founder representation to at least 10 parents, and with the 2005 seeds we will have 5 founders.
'Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	2	33	Develop a program of genetic management	Complete	FY 1995 - FY 1999	FY 1995 - FY 1999	U.S. Fish and Wildlife Service, Ecological Services Division, Hawaii Department of Land and Natural Resources	Management: Planning	Internal Administrative	See task 31.

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`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	2	34	Implement controlled breeding programs	Ongoing Current	FY 1995 - FY 1999		U.S. Fish and Wildlife Service, Ecological Services Division, Hawaii Department of Land and Natural Resources	Management: Propagation	Contract	See task 32.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	3	41	Design a reestablishment program for the silversword	Complete	FY 1995 - FY 1999	FY 1995 - FY 1999	University of Hawaii, Hawaii Department of Land and Natural Resources, U.S. Geological Survey, Biological Resources Division	Management: Planning	Contract	See task 31.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	3	42	Implement reestablishment program	Ongoing Current	Prior to FY 1995		U.S. Fish and Wildlife Service, Ecological Services Division, Hawaii Department of Land and Natural Resources	Management: Propagation	Contract	See task 32.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	3	43	Monitor all reestablished populations	Ongoing Current	Prior to FY 1995		U.S. Fish and Wildlife Service, Ecological Services Division, Hawaii Department of Land and Natural Resources	Research: Population Surveys	Contract	The Hawaiian Silversword Foundation and DLNR monitor portions of the reintroduced individuals on annual basis, covering the entire population approximately every 5 years.
`Ahinahina (Argyroxiphium sandwicense ssp. sandwicense)	3	5	Verify recovery objectives	Not Started			U.S. Fish and Wildlife Service, Ecological Services Division, Hawaii Department of Land and Natural Resources	Management: Planning	Internal Technical Assistance	The revision of recovery objectives will be considered when planted individuals begin producing viable seeds and natural seedling establishment occurs. At that point, the likelihood of success of the reintroduction effort will be better understood, and numbers of individuals needed can be adjusted based on reproductive success.